# A COMPOUND *EUCALYPTUS* HYBRID.

By L. D. Pryor.

(Plates xiii–xiv.)

[Read 26th November, 1952.]

*Synopsis.*

The existence of a compound hybrid derived from *Eucalyptus Rossii*,* *E. dives* and *E. macrorrhyncha* is deduced on the basis of a progeny test.

## Introduction.

Numerous cases of hybrids between well defined *Eucalyptus* species have been detected in the field and some others have been synthesized under controlled conditions. During field examinations individuals and sometimes hybrid swarms have been examined in which it has been necessary, for a satisfactory explanation, to postulate that more than two species have been concerned in the parentage. Clearer evidence of this has so far been lacking, but an interesting progeny now two years old has disclosed distinct elements of three separate species in the make-up of the parent tree.

## Progeny Test.

Seed was collected from an apparent hybrid at Black Mountain, A.C.T., and about 40 plants were raised in 1949 and planted out in 1950. The plants are now about two feet high and display very clearly the juvenile characters. The parent was assessed, before the progeny test, as a hybrid between *E. Rossii* and *E. dives*. No sign of *E. macrorrhyncha* was sufficiently clear to suppose at that stage that it was present in the hybrid combination. At two years of age, however, undoubted *E. macrorrhyncha* characters have appeared both in indumentum and leaf shape and are easily recognized in the progeny. Some segregates approximate closely in their juvenile form to each of the other presumed parents also. There are in addition various combinations amongst them of the characteristic juvenile forms of the three species (Pl. xiii, figs. 1, 2, 3).

The juvenile characters of the three species happen to be markedly distinct, which makes the material suitable for detection of such inheritance at an early age. *E. dives* has sessile, ovate-lanceolate, highly glaucous, opposite leaves (Pl. xiv, fig. 8); *E. Rossii* has, after two or three preliminary pairs of leaves beyond the cotyledons, alternate, petiolate, narrow-lanceolate grey-green leaves (Pl. xiv, fig. 9); *E. macrorrhyncha* likewise has alternate leaves but they are ovate with a distinctively tapered apex. In *E. macrorrhyncha* they are also petiolate and dull green, and in addition in the earlier stages are well covered with so-called stellate hairs (actually clusters of hairs on protuberances) which is a distinctive feature of the "stringybark" group of species to which *E. macrorrhyncha* belongs (Pl. xiv, fig. 7). All of these characters are strongly displayed in the progeny. Some individuals in the present stage are almost indistinguishable from *E. dives* (Pl. xiii, fig. 5), or alternatively from *E. Rossii* (Pl. xiv, fig. 6). Those approaching *E. macrorrhyncha* (Pl. xiii, fig. 4), however, are less close to the characteristic form of that species in the juvenile condition than the former two. Nevertheless the two distinctive characters of "stellate hairs" and leaf shape, as well as the general habit of the seedlings, are unmistakably present, and there is little doubt that *E. macrorrhyncha* has entered into the combination.

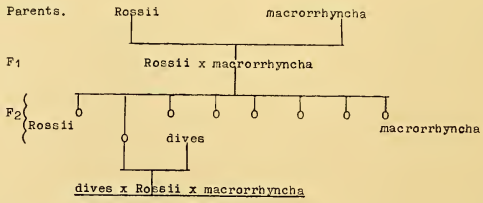
Other characters of diagnostic value will appear as the plants flower and fruit and as the mature type of bark develops which will allow more accurate assessment of the degree of contribution from each parent.

* Nomenclature and spelling as in Blakely, "A Key to the Eucalypts", 1934.

## Discussion.

There is no difficulty in finding a likely explanation for this combination. Hybrids between *E. Rossii* and *E. macrorrhyncha* have been located and substantiated by progeny testing. They also occur in the locality from which the seed was collected in this case. The minority representation of the *E. macrorrhyncha* characters in the progeny suggests that either some of its characters are suppressed by those of the other species, or, more likely, that one of the parents was a segregate with a preponderance of *E. Rossii* characters from an *E. macrorrhyncha* × *E. Rossii* hybrid swarm. One might say that it is equally possible that the *E. macrorrhyncha* entered the combination through a hybrid with *E. dives* and a subsequent segregate from this combined with *E. Rossii*. The *E. dives* × *E. macrorrhyncha* combination is, however, less frequent than the *E. Rossii* × *E. macrorrhyncha* combination.

There is still another aspect which is interesting and which may be significant. In some progenies of *E. pauciflora* × *E. dives* raised previously, "stellate" hairs have occasionally been noticed, suggesting, along with other general morphology, the rather faint presence of characters in the progeny derived from some stringybark species. The "stellate" hair character is very distinctive and one which is completely lacking in species other than stringybarks on the southern tablelands. It seems very probable that their presence indicates inheritance from a stringybark species, but the possibility must not be completely ruled out that these two characteristics from *E. macrorrhyncha*, tapered leaf at apex and stellate hairs, may both have arisen by some unusual gene interaction. It is easy to imagine the *E. macrorrhyncha* leaf shape arising by gene interaction between certain of the genes determining the narrow *E. Rossii* leaf and the broad *E. dives* leaf. However, it is much more difficult, although not impossible, to imagine such an origin for "stellate" hairs. For example, Saunders (*Jour. Genetics*, 10, 1920: 149) describes some complex interactions between four gene loci for hairiness in the stock (*Matthiola*). Full hairiness is obtained only by the presence of four dominants, two of which, C and R, are necessary for the development of anthocyanin in the flowers. It is possible that similar complex gene interaction could be responsible for the production of "stellate" hairs characteristic of *E. macrorrhyncha*. However, in three other progenies from the presumptive F1 hybrid *E. Rossii* × *E. dives*, no such "stellate"-haired plants have arisen, nor has there been any sign of the *E. macrorrhyncha* leaf shape. Thus probably the results are to be explained in the following way:




The cases in which "stellate" hairs have been observed in *E. pauciflora* × *E. dives* progenies have been with parents which were not growing close to any stringybark tree. This character has therefore appeared as a "phantom" preserved in the genetic makeup of the tree concerned.

It is possible in comparison with species like *E. dives*, *E. pauciflora* and *E. Rossii*, that *E. macrorrhyncha*, though a little more exacting species in its habitat requirements, has characters which, if preserved in hybrid combination with these species, would aid survival of the hybrid.

In particular, the character of "apical dominance" and rapid early growth favours the species possessing it over those which do not, at least for survival in the youthful stages. It is possible therefore that the presence of stringybark characters indicates a combination better adapted to survive under conditions which have developed since

settlement. It has been observed in some hybrid combinations of *E. dives* × *E. pauciflora* that the hybrids though fast growing are relatively short lived—say forty or sixty years. With the reduced average age of trees which has followed settlement and tree clearing, the preservation of hybrid combinations which are favourable to survival in the relatively early stages of growth would probably increase, and perhaps for this reason the appearance of the stringybark influence has become more prominent. The fact that *E. macrorrhyncha* (and even more so other stringybarks) requires a somewhat better site than the other species concerned, would make perhaps for shorter life on sites poorer than that which the stringybark normally occupies. This, however, would be less critical for survival when the average age of the stand is shortened.

The question is of considerable interest and its fuller investigation will be aided by the distinctive inherited condition of "stellate" hairs to provide rapid assessment of the genetic condition of the individuals examined.

## EXPLANATION OF PLATES XIII-XIV.

### Plate xiii.

1. A segregate in the progeny from the hybrid, showing mixed characters, especially the pointed broad leaf of *E. dives*, but other characters derived from the other species.
2. Segregate with some characters of *E. macrorrhyncha* in combination with *E. dives*.
3. Segregate with a preponderance of *E. Rossii* characters, but strongly influenced by *E. dives* in the preservation of almost opposite and rather broad leaves.
4. A segregate closely approaching *E. macrorrhyncha*.
5. A segregate almost identical with *E. dives*.

### Plate xiv.

6. A segregate closely similar to *E. Rossii*.
7. A seedling of pure *E. macrorrhyncha* of the same age.
8. A seedling of pure *E. dives* of the same age.
9. A seedling of pure *E. Rossii* of the same age.

# VARIABLE RESISTANCE TO LEAF-EATING INSECTS IN SOME EUCALYPTS.

By L. D. Pryor.

(Plate xv; one Text-figure.)

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*Synopsis.*

Progeny tests and morphological analyses of *Eucalyptus* hybrids indicate that in some *Eucalyptus* species resistance to leaf-eating scarab beetles is a heritable character, probably with some capacity to assort independently in segregating populations.

## Introduction.

Many species of *Eucalyptus* are very susceptible to attack by leaf-eating insects which at times completely defoliate them. Carne (1950) has studied in considerable detail the species involved and has found at least twenty kinds of scarab beetle belonging to several genera and also species in other orders which are commonly concerned. While there are fluctuations from season to season, it is clear that attack in general varies in intensity with different *Eucalyptus* species, some being almost resistant while others are regularly and heavily eaten.

Among the ornamental plantations in Canberra there have been some interesting cases of resistance, two of which have been selected for study. The first is that of one resistant individual among a susceptible population; the second, a tree heavily eaten while its companions were more or less untouched.

## Individual Resistance.

In a plantation of some 30 trees of *Eucalyptus rubida** about 25 years old, there was one tree which remained almost untouched while the remainder were completely defoliated. The plantation was attacked in the summer of 1949–50 by the scarab beetle, *Anaplognathus montanus* Macl. All leaves were eaten and the crown was reduced to a mass of twigs many of which died. A similar thing happened in the summer of 1947–48 due to the same insect, and it occurred about two years previously as well as on still earlier occasions, but the records before 1947–48 are not precise. On each occasion the one resistant tree referred to remained almost untouched and appeared quite unpalatable to the beetle. It is in a line of trees of *E. rubida* spaced about 60 feet apart and does not differ from that species in its general form and appearance in any way that can be detected easily. In the hand specimen, however, most of the umbels have more than three flowers. Sometimes there is a three-flowered umbel on a branch which has otherwise multi-flowered umbels and also small branches are found on which most of the umbels are three-flowered (Pl. xv, fig. 1). The three-flowered umbel is a highly distinctive feature of *E. rubida*. Care must be taken of course to distinguish between an umbel which emerges as a three-flowered umbel and one which, while originally containing more flowers, is reduced to three by dropping of some of the additional buds. In the latter case, the resultant scars at the top of the peduncle are seen with careful observation. Irregular departure from this three-flowered umbel has been found associated with hybridization in other species (Pryor, 1950). It was thought therefore that this individual might be a hybrid, and a progeny test was carried out.

## Progeny Test.

Seedlings were raised from the resistant tree using the method employed in a previous examination of some hybrids (Pryor, 1951). Fifty plants were raised in each case and in seven months provided the relevant information.

* Nomenclature and spelling as in Blakely "A Key to the Eucalypts" (1934).